Among spinoff innovations in medicine is a line of efficiency enhancing products for separating chemical compounds in fluids

In the early 1970s, Jet Propulsion Laboratory (JPL) undertook a community service project to meet a need of the Los Angeles Police Department. The department's forensic chemistry laboratory needed a reliable but more rapid way of detecting drugs in blood or urine samples taken from suspected narcotics users. JPL applied its world renowned technological expertise, invented a technique for speedier separation of biological compounds, then advanced the technique another step by developing a method of automating the process. The JPL effort provided a technology base for a line of sample preparation products developed by Analytichem International, Harbor City, California and sold all over the world.

Liquid/liquid extraction is a term used in chemistry to describe a method of separating chemical compounds contained in blood, urine or other biological fluids for research or forensic work, medical treatment or pharmaceutical manufacture. At the time JPL began its research, the conventional extraction process involved transferring the compounds to be separated into a solvent liquid in a series of complicated operations—agitation, emulsion formation, centrifuge spinning, mechanical filtration and other steps, each step time-consuming and each requiring certain special equipment.

Looking for a simpler, easier way, JPL developed a new single step extraction process that sharply cut processing time, reduced cost and eliminated much of the equipment requirement. The technique involved use of disposable tubes called "extraction columns" partially filled with an absorbent packing material, such as ceramic wool, shredded filter paper, glass wool, cellulose powder or absorbent cotton. In a typical extraction, a liquid sample was poured into an extraction tube where the packing material absorbed water and impurities from the sample and spread the specimen as a very thin film over a large area; this made the drug-bearing components easily separable through contact with organic solvents. To extract a particular compound, an appropriate liquid solvent was introduced to the tube. As the solvent passed through the packing material, the desired compound became dissolved in the solvent and exited through the tube's bottom stem, to be collected for further processing. By introduction of another solvent, a different compound could be extracted from the remaining sample.

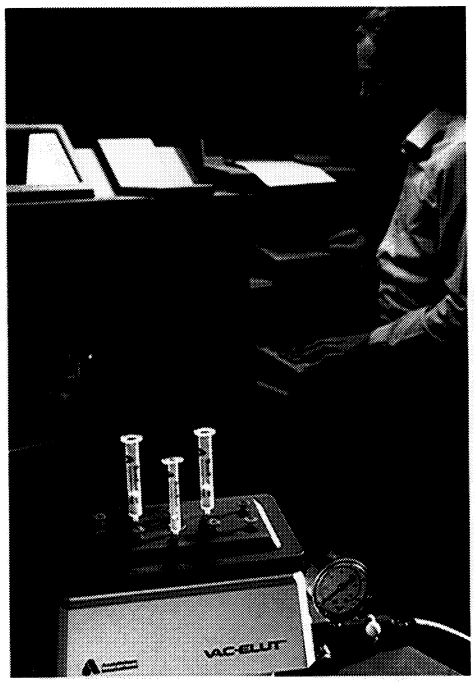
JPL then developed an automated system for analyzing the extracted compound. Called AUDRI—for Automated Drug Identification—the device combined computer, spectrographic and gas chromatograph technology in a system that removed the solvent from the extract, vaporized the extract, then directed the vapor into a series of gas chromatographs, instruments that separate and identify the various gases in a mixture and their amounts (AUDRI had a separate gas chromotograph for each family of compounds to be identified). The data from the chromatographs and other AUDRI instruments was sent to a

computer, which compared the data with a repertoire of drug characteristics stored in its memory and thus made a final drug identification.

NASA waived title for the extraction tube and AUDRI technology to JPL's parent organization, California Institute of Technology (Caltech) and Caltech granted licenses for commercial use of the technology to three companies, one of them Analytichem International. Analytichem initially introduced the JPL disposable extraction column under the trade name Extube™ and is still producing it in two forms: Chem Elut™ columns for applications demanding exceptional purity and Tox Elut®, specifically designed for urine drug abuse screening.

Analytichem has advanced the original technology by developing—for applications in sample preparation, analysis and pharmaceutical manufacturing—a range of Sepralyte® chemical isolation products based on silica adsorbing materials, or sorbents. A key Sepralyte product is Bond Elut®, a liquid/solid extraction column designed for fast, efficient, economical processing. The company also produces a variety of Bond Elut accessories, including a Vac Elut™ processing station that can handle up to 10 Bond Elut columns simultaneously and provide results in a few minutes.

In addition, Analytichem used the JPL/AUDRI technology as a departure point for company development of an automated sample extraction and analysis system known as AASP®. The instrument is manufactured by Varian Associates and Analytichem produces AASP Cassettes with 10 sorbent cartridges for



10 simultaneous sample extractions; the cassettes embrace the complete spectrum of Sepralyte sorbents to accommodate virtually any separation application. Analytichem's products have found wide and growing acceptance; thus, JPL's community service effort of a decade and a half ago played an important part in bringing new, efficiency-enhancing products to the marketplace and in generating sales running into the millions of dollars. ▲

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At left, a National Institute of Health technician is assaying a laboratory sample prepared by use of the equipment in foreground, a processing unit and a series of "extraction columns" that make possible rapid separation of the compounds in biological or other fluids. Developed by Analytichem International, the equipment and technique derive from technology originally developed by Jet Propulsion Laboratory to detect drugs in blood or urine samples.

Shown in closeup are two members of the Analytichem family of products for sample preparation and analysis: the Bond Elut (top) and Tox Elut extraction columns, the latter specifically designed for drug abuse screening.